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IS 12316-3-1 (1988): Non-cellulosic Papers for Electrical Purposes, Part 3: Requirements for Individual Materials, Section 1: Unfilled Aramid (Aromatic Polyamide) Papers Calendered [ETD 2: Solid Electrical Insulating Materials and Insulation Systems]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**SPECIFICATION FOR
NON-CELLULOSIC PAPERS FOR
ELECTRICAL PURPOSES**

PART 3 REQUIREMENTS FOR INDIVIDUAL MATERIALS

Section 1 Unfilled Aramid (Aromatic Polyamide) Papers Calendered

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

*Indian Standard***SPECIFICATION FOR
NON-CELLULOSIC PAPERS FOR
ELECTRICAL PURPOSES****PART 3 REQUIREMENTS FOR INDIVIDUAL MATERIALS****Section 1 Unfilled Aramid (Aromatic Polyamide) Papers Calendered****0. FOREWORD**

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 22 March 1988, after the draft finalized by the Solid Electrical Insulating Materials Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard (Part 3/Sec 1) is one of the series of Indian Standards which deal with non-cellulosic papers for electrical purposes. This series will have the following three parts:

Part 1 Definitions and general requirements

Part 2 Methods of test

Part 3 Requirements for individual materials

0.3 This standard (Part 3/Sec 1) covers the requirements of aromatic polyamide (nylon) paper, calendered.

0.4 Section 2 of the standard is on aromatic polyamide (nylon) paper, uncalendered.

0.5 Indian Standard specification for cellulosic papers for electrical purposes are covered by IS : 9335*.

0.6 In the preparation of this standard, assistance has been derived from IEC Doc 15C (Central Office) 146, Specification for non-cellulosic papers for electrical purposes : Part 3 Requirements for individual materials, Sheet. . . unfilled aramid papers, issued by the International Electrotechnical Commission.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Cellulosic papers for electrical purposes.

†Rules for rounding numerical values (revised).

1. SCOPE

1.1 This standard (Part 3/Sec 1) covers the requirements for unfilled aramid (aromatic polyamide) paper, calendered.

2. TYPES

2.1 The following types of calendered unfilled aramid paper are covered in this standard:

- a) *Type 1* Calendered paper
- b) *Type 2* Calendered paper, with improved tearing resistance and conformability

3. GENERAL REQUIREMENTS

3.1 The papers shall satisfy the requirements stated in IS : 12316 (Part 1)-1988*, in addition to those given in Table 1 and Table 2 for Type 1 and Type 2, respectively.

4. SAMPLING

4.1 Sampling procedure shall be in accordance with IS : 1060†.

*Specification for non-cellulosic paper for electrical purposes: Part 1 Definitions and general requirements.

†Methods of sampling and test for paper and allied products.

TABLE 1 REQUIREMENTS FOR TYPE 1 CALENDERED PAPER

(Clause 3)

PROPERTY	TEST METHOD, REF TO CLAUSE IN IS : 12316 (PART 2)-1988*	UNIT	REQUIREMENTS			TOLERANCE	REMARK
(1)	(2)	(3)	(4)			(5)	(6)
Thickness	3	µm	Nominal thickness of paper ≤ 50 µm > 50 µm			± 20 percent ± 15 percent	
Substance	4	g/m²				<div>MinMax</div>	
			50			3546	
			80			5475	
			130			100130	
			180			150200	
			250			220280	
			300			270340	
			380			350430	
			510			490600	
			610			630750	
			750			750910	
Apparent density	5	g/cm³	Nominal thickness µm			<div>MinMax</div>	
			50			0.640.88	
			80			0.710.97	
			130			0.791.02	
			180			0.871.09	
			250			0.881.08	
			300			0.921.10	
			380			0.931.13	
			510			0.971.17	
			610			1.041.26	
			750			1.001.25	
Tensile strength	6	kN/m width	Nominal thick- ness µm	Machine direc- tion	Cross direc- tion	Minimum specified	
			50	2.8	1.4		
			80	4.7	2.2		
			130	9.5	5.2		
			180	16.0	8.5		
			250	22.0	12.0		
			300	30.0	17.0		
			380	36.0	22.0		
			510	52.0	30.0		
			610	63.0	36.0		
			750	79.0	47.0		
Elongation	6	Percent	Nominal thickness	MD	CD	Minimum specified	
			50	6	5		
			80	7	6		
			130	11	9		
			180	13	11		
			250	13	11		
			300	13	12		
			380	13	12		
			510	13	12		
			610	13	12		
			750	13	10		

*Specification for non-cellulosic papers for electrical purposes: Part 2 Methods of test.

(Continued)

TABLE 1 REQUIREMENTS FOR TYPE 1 CALENDERED PAPER — Contd
 TEST METHOD,
 REF TO CLAUSE IN
 IS : 12316 (PART 2)-1988*

PROPERTY	TEST METHOD, REF TO CLAUSE IN IS : 12316 (PART 2)-1988*	UNIT	REQUIREMENTS			TOLERANCE	REMARK
(1)	(2)	(3)	(4)			(5)	(6)
Edge tearing strength	8	N	Nominal thickness μm	Machine direction	Cross direction	Minimum specified	
			50	48	24		
			80	100	44		
			130	200	80		
			180	300	130		
			250	400	160		
			300	460	180		
			380	480	180		
			510	520	200		
			610	520	240		
			750	640	240		
Electric strength	10	kV/mm	Nominal thickness μm	Machine direction		Minimum specified	
			50	15			
			80	18			
			130	21			
			180	27			
			250	27			
			300	27			
			380	25			
			510	25			
			610	23			
			750	21			
Shrinkage on heating	11	Percent	Nominal thickness μm	Machine direction	Cross direction	Maximum specified	
			50	4.0	2.0		
			80	3.0	2.0		
			130	2.0	2.0		
			180	2.0	2.0		
			250	2.0	2.0		
			300	2.0	2.0		
			380	2.0	2.0		
			510	1.5	1.5		
			610	1.5	1.5		
			750	1.5	1.5		

*Specification for non-cellulosic papers for electrical purposes: Part 2 Methods of test.

TABLE 2 REQUIREMENTS FOR TYPE 2 CALENDERED PAPER
 (Clause 3)

PROPERTY	TEST METHOD, REF TO CLAUSE IN IS : 12316 (PART 2)-1988*	UNIT	REQUIREMENTS		TOLERANCE	REMARK
(1)	(2)	(3)	(4)		(5)	(6)
Nominal thickness	3	μm	50		± 15 percent	
Substance	4	g/m^2	Nominal thickness μm		Min Max	
			180		150 200	
			250		220 280	
			300		270 340	
			380		350 430	
Apparent density	5	g/cm^3	180		0.85 1.07	
			250		0.85 1.09	
			300		0.85 1.09	
			380		0.85 1.09	

*Specification for non-cellulosic papers for electrical purposes: Part 2 Methods of test.

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TABLE 2 REQUIREMENTS FOR TYPE 2 CALENDERED PAPER — *Contd*

PROPERTY	TEST METHOD, REF TO CLAUSE IN IS : 12316 (PART 2)-1988*	UNIT	REQUIREMENTS			TOLERANCE	REMARK
(1)	(2)	(3)	(4)			(5)	(6)
Tensile strength	6	kN/m width	Nominal thickness μm	Machine direc- tion	Cross direc- tion	Minimum specified	
			180	11.0	5.5		
			250	19.0	8.5		
			300	24.0	11.0		
			380	27.0	14.0		
Elongation	6	Percent	180	7	7	Minimum specified	
			250	11	11		
			300	11	11		
			380	11	11		
Edge tearing strength	8	N	180	320	160	Minimum specified	
			250	520	280		
			300	600	300		
			380	800	440		
Electric strength	10	kV/mm	Nominal thickness μm	Machine direction		Minimum specified	
			180	25			
			250	25			
			300	25			
			380	23			
Shrinkage on heating	11	Percent	Nominal thickness μm	Machine direc- tion	Cross direc- tion	Maximum specified	
			180	3.0	3.0		
			250	3.0	3.0		
			300	3.0	3.0		
			380	3.0	3.0		

*Specification for non-cellulosic papers for electrical purposes: Part 2 Methods of test.

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